Metals

Through the use of data generated by conventional field and laboratory analyses, LDEQ identified waterbodies from the Mermentau and Vermilion watersheds that did not meet water quality standards for copper, lead, cadmium and mercury and listed these waterbody/pollutant combinations on the state's 1998 Clean Water Act Section 303(d) List. Due to the concern of possible sample contamination, the state re-sampled these waterbodies using clean sampling and analysis techniques.

EPA developed new sampling and analysis methods (commonly referred to as clean techniques) to specifically address state needs for measuring toxic metals at water quality criteria levels, when such measurements are necessary to protect designated uses in state water quality standards. The latest criteria published by EPA are those listed in the National Toxics Rule (58 *FR* 60848) and the Stay of Federal Water Quality Criteria for Metals (60 *FR* 22228). These rules include water quality criteria for 13 metals, and it is these criteria on which the new sampling and analysis methods are based. In addition, method 1631 was specifically developed to provide reliable measurements of mercury at EPA water quality criteria levels.

In developing these methods, EPA found that one of the greatest difficulties in measuring pollutants at these levels was precluding sample contamination during collection, transport, and analysis. The degree of difficulty, however, is highly dependent on the metal and site-specific conditions. This analytical method, therefore, is designed to provide the level of protection necessary to preclude contamination in nearly all situations. It is also designed to provide the procedures necessary to produce reliable results at the lowest possible water quality criteria published by EPA. In recognition of the variety of situations to which this method may be applied, and in recognition of continuing technological advances, the method is performance based.

LDEQ re-assessed its 1998 metals listing utilizing the new data and its established protocol for CWA Section 305(b) reporting and Section 303(d) listing. Based on the results of LDEQ's evaluation, one waterbody showed an exceedance of the copper criterion and a TMDL has been developed by LDEQ for that waterbody (Bayou Cocodrie, Subsegment No. 0660201). No exceedances were detected for the following waterbody/pollutant combinations:

> Bayou Des Cannes (050101) Copper and Lead, Bayou Plaquemine Brule (050201) Lead, Bayou Nezpique (050301) Copper and Lead, Mermentau River (050401) Copper, Lead and Mercury, Bayou Que de Tortue (050501) Lead, Lacassine Bayou (050601) Lead, White Lake (050703) Lead, Mermentau River (050801) Copper, Spring Creek (060101) Cadmium, Copper, Lead and Mercury, Bayou Cocodrie (060201) Lead, Chicot Lake (060203) Copper and Lead, Bayou Courtableau (060204) Lead, Bayou Teche (060205) Lead, Vermillion River (060801) Cadmium and Lead, Vermillion River (060802) Lead, Bayou Carlin (060902) Copper, Vermillion Bay (061104) Copper.

LDEQ also submitted copper data, collected by Gaylord Container Corporation, Bogalusa, Louisiana, from five sites on the Pearl River, subsegments 090101 and 090202. These data were collected and analyzed using clean techniques, and no copper exceedances were detected.

Based on the results of the sampling and analysis using clean techniques, water quality standards are being maintained in the above listed waterbodies.

References:

LDEQ. 1998. *Environmental Regulatory Code, Part IX. Water Quality Regulations.* Louisiana Department of Environmental Quality.

LDEQ. 1999. Comment letter from LDEQ to EPA Region 6, "Comments on Federal Register Notice Dated November 29, 1999 (Volume 64, Number 228) - Court Ordered Clean Water Act Section 303(d) List for the State of Louisiana".

Turbidity and Total Suspended Solids (TSS)

The Louisiana 1998 303(d) list contains waterbodies due to turbidity and TSS concerns. These assessments were based largely on the best professional judgement of LDEQ regional coordinators in these basins. In order to confirm or reject the presence of these suspected causes, LDEQ Assessment Unit staff of the Planning and Assessment Section evaluated waterbodies for which numerical turbidity "guidelines" were available. These guideline values are promulgated values from the Louisiana Water Quality Standards (LDEQ, 1998). Where specific guideline values are not provided, a value of 150 nephelometric turbidity units (NTU) was used. 150 NTU is the turbidity guideline given in the state's water quality standards for the Mermentau and Vermilion Rivers, the major streams for the basins being evaluated. The standards also establish turbidity guidelines of 25 NTU for scenic streams and 50 NTU for estuarine lakes. The evaluation was completed by comparing turbidity data available from the state's fixed station monitoring network to the appropriate guideline.

The turbidity assessment procedure uses percentages of exceedances to evaluate if a stream is meeting its designated use with respect to the turbidity guidelines. Turbidity is considered to be a secondary criterion for fish and wildlife propagation uses and exceedances up to 30% are allowed. Assessments were conducted on six stream segments including Bayou Plaquemine Brule (26.4%), Mermentau River-Origin to Lake Arthur (8.7%), and Lacassine Bayou- headwaters to Intracoastal Waterway (21.5%). These were compared to the 30% allowance for exceedances and were delisted. Bayou Queue de Tortue (41.5%) was evaluated as only partially supporting and a TMDL has been completed by EPA. For Outstanding Natural Resource Waters (ONRW), turbidity is considered a primary criterion and a more conservative level of no greater than 10% exceedances is used. Two segments, Spring Creek and Bayou Cocodrie – Hwy 167 to Bayou Boeuf-Cocodrie Diversion Canal are classified as ONRWs. Exceedance percentages with respect to the 25 NTU guideline were 9.2 %and

9.4 % respectively. Spring Creek and Bayou Boeuf-Cocodrie Diversion Canal were delisted for turbidity based on this assessment.

Louisiana water quality standards do not establish a TSS criterion. Although turbidity and TSS describe separate physical properties there is an established water quality relationship between the two measures. Total suspended solids is defined as the residue left after passing a water sample through a standard glass fiber filter and dried at 103° C for two hours. Turbidity is the measure of the optical property of water that causes light to be either scattered or absorbed. (APHA,1992) Turbidity may be influenced by a number of factors but primarily suspended matter such as clay, silt, plankton, or microscopic organisms. These would be the same components of a TSS analysis. Although turbidity may be influenced by colored organic compounds and some more finely divided organic and inorganic materials, suspended sediments are associated with and contribute to turbidity (Waters, 1995). While it is difficult to correlate the gravimetric portion of a sample (TSS) directly with turbidity there is an established general relationship. However analysts should not assume a particular TSS-turbidity correlation without evaluating the local relationship (USEPA, 1999). A review of several water quality stations from the Mermentau Basin show that there is a demonstrated relationship between average turbidity and average TSS values in these watersheds.

Given that there is no criterion for TSS in the Louisiana standards and that there are turbidity guidelines and there exists a general relationship between turbidity and TSS, a listing under both parameters is duplicative. Where waters meet their established turbidity guideline it is interpreted that they are meeting any water quality concerns related to TSS as well.

References:

American Public Health Association. 1992. *Standard Methods for the Examination of Water and Wastwater 18^{h} ed.*

LDEQ. 1998. *Environmental Regulatory Code, Part IX. Water Quality Regulations.* Louisiana Department of Environmental Quality.

U.S. Environmental Protection Agency. 1999. *Protocol for Developing Sediment TMDLs*. EPA 841-B-99-004. Office of Water (4503F), United States Environmental Protection Agency, Washington D.C. P. 4-5.

Waters, T. F. 1995. *Sediment in Streams: sources, biological effects, and control*. American Fisheries Society Monograph 7. P. 53.

White Lake

White Lake is a large isolated coastal water body located in the Cheniere Plain of southwestern Louisiana in the lower portion of the Mermentau River Basin. This waterbody is part of the coastal Mermentau Management Unit that extends east from the natural mouth of the Mermentau River to the Freshwater Bayou Canal. The lake is approximately 15 miles long (from west to east) and five miles wide, with an average depth of approximately five feet and a bottom consisting of soft, muddy sediment. Surrounding the lake is an expanse of freshwater marsh in which there is an intricate canal system and natural waterways which connect the lake with Vermilion Bay to the east, Grand Lake to the west and the Intracoastal Waterway to the north. This allows for some freshwater drainage with inland areas and controlled tidal exchange with the Gulf of Mexico. Salinity in the lake is low to intermediate, occasionally brackish with mean and median values below 250 mg/L chlorides and 1000 umhos conductivity.

This portion of the Louisiana coastline is eroding at a rate of approximately 4.5 feet per year. In general, the northwestern and southeastern shorelines of White Lake have the highest erosion rates. This erosion pattern seems to be related to wind speed and direction across the lake. Due to its shallow waters and large surface area, wind dominated tides drive water circulation in both White Lake and Grand Lake. Large waves hitting the shore are the primary cause of erosion and deposition of sediments on the lake bottom. As a result of this natural wind and wave action, the lake continually is mixed from top to bottom, resuspending sediments from the bottom of the lake into the water column.

White Lake currently has the following designated uses: primary and secondary contact recreation, fish and wildlife propagation, and agriculture. According to Louisiana's 1998 Water Quality Inventory, the fish and wildlife use was assessed as being impaired due to the exceedance of the numerical criteria for lead. Monitored data collected by Louisiana Department of Environmental Quality (LDEQ) regional staff during 1996 and 1997, was the source of this determination; however, since that time, there has been some concern of possible sample contamination. Preventing ambient water samples from becoming contaminated during the sampling and analytical process constitutes one of the greatest difficulties encountered in trace metals determinations. Over the last two decades, marine chemists have come to recognize that much of the historical data on the concentrations of dissolved trace metals in seawater are erroneously high because the concentrations reflect contamination from sampling and analysis rather than ambient levels. Therefore, it is imperative that extreme care be taken to avoid contamination when collecting and analyzing ambient water samples for trace metals.

EPA developed new sampling and analysis methods (commonly referred to as ‘clean techniques’) to specifically address state needs for measuring toxic metals at water quality criteria levels, when such measurements are necessary to protect designated uses in state water quality standards. During the summer and fall of 1999, LDEQ re-sampled the lake using ‘clean techniques’ sampling and analysis. This second set of data demonstrated that there was no exceedance of the metals standard and full attainment of the fish and wildlife use.

In addition to lead, turbidity was another suspected cause of impairment on White Lake. This determination was based on evaluative assessments also performed by LDEQ regional staff during 1996 and 1997. Evaluations of use support and water quality conditions were based upon best professional judgement and observations of each waterbody. Turbidity caused by resuspension of sediment due to wind and wave action does not impair any designated uses since the State's General Criteria regulation for turbidity applies to conditions "other than that of natural origin" (LAC 33:IX.1113.B.9). At this time the fish and wildlife propagation use is being attained and fishing activities currently continue on White lake. According to LDEQ staff, fishing has been an historical activity on the lake, primarily for catfish, and also seasonally for shrimp and blue crab. References indicate that these species are highly tolerant of turbid waters.

After a thorough review of new and more complete data and information on White Lake, EPA concludes that the existing turbidity and siltation concentrations in this waterbody are primarily due to background conditions of natural origin. This conclusion is supported by all available data and information regarding other possible sources for the turbidity in the lake. The nearest agricultural fields are over ten water miles to the north and the runoff is contained outside the lake's system. Historically there have not been any permitted point sources discharging to the lake. There are no significant dredging or mining activities in White Lake that would affect the waterbody's turbidity. Instead, it is a combination of the lake's natural features (large surface area, long fetch, shallow depth, and muddy bottoms) along with high wind and wave action that are the probable cause of the existing turbidity and siltation levels.

References:

LDEQ. 1998. *Environmental Regulatory Code. Part IX. Water Quality Regulations.* Louisiana Department of Environmental Quality.

LDEQ. 1998. *1998 Louisiana Water Quality Inventory*. Louisiana Department of Environmental Quality, Office of Water Resources.

National Academy of Sciences, National Academy of Engineering. 1972. *Water Quality Criteria, 1972.* U. S. Government Printing Office, Washington, D.C.

New Mexico Department of Game and Fish Website:
http://www.gmfsh.state.nm.us/PageMill_TExt/Fishing/catfish.html

Spring Creek

Spring Creek was listed on the Louisiana 1998 303(d) list as impacted due to siltation. There are no numeric guidelines or criteria for siltation and there is little or no existing information available that would allow a direct evaluation of stream substrate conditions. Therefore, it is

necessary to establish an indicator that may be used as a quantitative measure of water quality impacts. This indicator establishes the relationship (linkage) between a pollutant and the presumed water quality impact. A review was conducted of data and information available for Spring Creek in an attempt to establish possible indicators. One water column characteristic that has been widely used as an indicator of the potential for sediment accumulation in streambeds is suspended sediment. Water column data for suspended sediment and turbidity is available from the Louisiana water quality monitoring station on Spring Creek near Glenmora. Suspended sediment may be used as an indirect water column indicator of sediment load. The State has established turbidity guidelines that may be used to establish a target for suspended sediment loading.

It must be emphasized that the presence of suspended sediments does not establish that streambed impacts are present, only that there is potential for such problems to exist. Suspended sediment loading values greater than the target load represent higher potential for siltation impacts. Conversely values lower than the target load represent a low potential for siltation concerns. Numerous stream characteristics may exist that affect how sediment loads are manifested in a stream system. Direct evaluation of stream bottom substrates is necessary to establish that accumulations of these sediments are occurring.

In order to convert the turbidity guideline to a suspended sediment value, a relationship between turbidity and suspended sediment must be established. A scatter plot of turbidity vs. suspended sediment for Spring Creek is presented in the attached graphic. This graphic shows that there is a moderate correlation (R^2= 0.66) between the two water column parameters. It is therefore possible, with some confidence, to project a suspended sediment value that would correspond to a given turbidity value. In the case of Spring Creek the State turbidity guideline is 25 NTU. Using the relationship established by the trend line in the attached figure a corresponding value of 30 mg/l suspended solids would be expected to be associated with this value. The average annual flow calculated from a stream flow monitoring gage at Glenmora is 135 cfs (87 mgd).

The carrying capacity of a stream for a given characteristic may be calculated by applying the formula 8.345 x flow (mgd) x applicable numeric criteria. Applying this formula, where flow is 87 mgd and the criterion is 30 mg/l, the allowable suspended sediment load for Spring Creek is 21,780 lbs/day. For purposes of this calculation an additional 20% margin of safety will be applied making the allowable sediment load 17,425 lbs/day. Evaluation of the suspended sediment data for Spring Creek yields an average suspended solid value of 15 mg/l. Using the above formula, the measured sediment load for Spring Creek is 10,890 lbs/day. The measured sediment load for Spring Creek is less than the calculated carrying capacity; therefore the potential for sedimentation impacts is low. The segment is determined to meet narrative water quality standards for siltation and no TMDL is required.

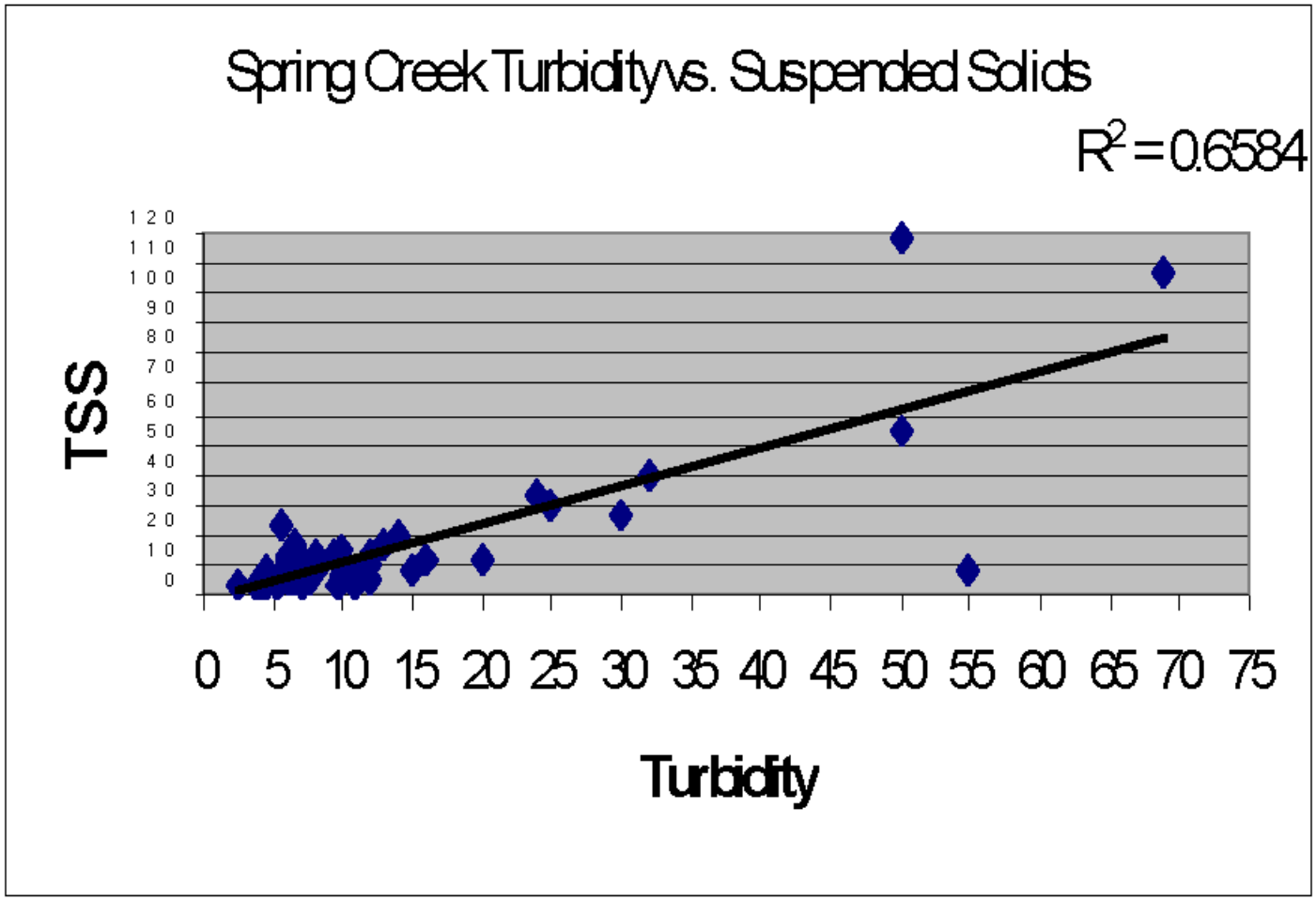
References:

LDEQ. 1998. *Environmental Regulatory Code. Part IX. Water Quality Regulations.* 1998. Louisiana Department of Environmental Quality.

LDEQ Data Web Site.www.deq.state.la.us/surveillance/wqdata/wqnsites.stm

U.S. Environmental Protection Agency. 1999. *Protocol for Developing Sediment TMDLs*. EPA 841-B-99-004. Office of Water (4503F), United States Environmental Protection Agency, Washington D.C. P. 4-5.

Waters, T. F. 1995. *Sediment in Streams: sources, biological effects, and control*. American Fisheries Society Monograph 7. P. 53.


Spring Creek Turbidity vs. Suspended Solids
R2 = 0.6584
TSS
120
110
100
90
80
70
60
50
40
30
20
10
0
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
Turbidity

Nutrients

In the State of Louisiana Surface Water Quality Standards, the general criteria for nutrients states "The naturally occurring range of nitrogen-phosphorus ratios shall be maintained." EPA has identified nutrient ratios using historical values in the State of Louisiana's database, and ranges of ratios found in scientific literature indicating nitrogen or phosphorus limitation (references below). The literature indicates where the nitrogen to phosphorus ratio is less than ten, a water body system is considered to be nitrogen limited. The nitrogen to phosphorus ratio increases with either an increase in nitrogen or a decrease in phosphorus.

Total nitrogen and total phosphorus values were used in the analysis of state data obtained from the LDEQ Data Web Site on February 11, 2000. The following sites were assessed:

Vermillion River, 0001, 0002, 0067, 0314, 0677, 0678
Bayou Teche, 0030, 0031, 0100, 0673
Mermentau River, 0003
Bayou Plaquemine Brule, 0004
Bayou Queue de Tortue, 0046

Review of historical State data of water bodies listed for nutrients indicate that all assessed sampling sites displayed nitrogen limitation ratios and that phosphorus was not in excess. There are no sites with ratios indicating that phosphorus is clearly the limiting nutrient. It is EPA's conclusion that TMDLs for phosphorus are not warranted at this time for the above listed water bodies because TMDLs have been established for nitrogen and controls on nitrogen will render controls on phosphorus as unnecessary. Controls on nitrogen, which are addressed in Louisiana's National Pollutant Discharge Elimination System and Nonpoint Source Program, will address nutrient impacts in the waters of Louisiana.

References:

Allen, J. D. 1995. *Stream Ecology: Structure and Function of Running Waters.* Chapman and Hall, London.

Day, J.W. Jr., et al. 1989. *Estuarine Ecology.* John Wiley and Sons, New York.

LDEQ. 1998. *Environmental Regulatory Code, Part IX. Water Quality Regulations.* Louisiana Department of Environmental Quality.

LDEQ Data Web Site. www.deq.state.la.us/surveillance/wqdata/wqnsites.stm

Wetzel, R. G. 1975. *Limnology.* W.B. Saunders Co., New York.